

# MATH-GY.7033 and MATH-GA.2110-002: Linear Algebra I

## New York University, Fall 2025

Lectures: Thursday 5-7:30pm, Jacobs Hall room 301

**Instructor:** Yifan Guo (yg3991@nyu.edu)

**Office Hours:** Thursday 4-5pm in person at 2 Metro Tech Center Room 870 and Monday 10-11am over Zoom (<https://nyu.zoom.us/j/7908587953>) or in person at Warren Weaver Hall 619.

**Textbook:** The course will roughly follow the book: Linear algebra, fourth edition by Steven Friedberg, Arnold Insel and Lawrence Spence, Prentice Hall, 1997. It is available at

<https://anandinstitute.org/pdf/lenearal.pdf>.

There will be some adjustments in notation, order, contents, and proofs. I will upload my lecture notes to Brightspace.

**Reference:** Other good sources of reference are:

Linear algebra done right, by Sheldon Axler, 2025,

Linear algebra done wrong, by Sergei Treil 2025,

Linear algebra and its applications, second edition by Peter Lax, Wiley, 2007.

**Overview of the course:** This course provides a rigorous introduction to the fundamental concepts of linear algebra, emphasizing both its mathematical structure and applications. Topics include vector spaces, linear transformations and matrices, systems of linear equations, determinants, eigenvalues and eigenvectors and their applications. The course is self-contained, starting from the definitions and deducing everything from them. Some background in undergraduate linear algebra may be helpful.

**Homework:** Homework will be posted every week by Friday and will be due on the Sunday of the following week at 11:59 PM. The first one is due on 09/14/2025. Homework is submitted through Gradescope. You can either handwrite and scan, or type with L<sup>A</sup>T<sub>E</sub>X, and then upload to the appropriate assignment on Gradescope. No make-up homework will be accepted for any reason. Your best 10 homework scores will count toward your final grade.

**Brightspace:** You should be able to access the course page on NYU Brightspace. The main section we will use is Content, where I will upload the syllabus, lecture notes, and homework assignments.

**Gradescope:** You can access the Gradescope page for this course directly through NYU Brightspace. To find it: go to the course page on Brightspace, navigate to the Content section and click on Link to Gradescope. Please submit your homework on Gradescope.

**Exams:** Exams will be held in person, closed book, and without the use of phones or other electronic devices. The midterm exam will be held in class on **October 23**. The final exam is TBA. For exams make-up policies see “General notes from University” below.

**Grading policy:** The final course grade will be based on Homework 40% (each assignment with equal weight, counting the best 10), Midterm 25% and Final 35%. The letter grades will be determined from this score using the following table:

Cutoff (minimum %)	Grade
93	A
90	A-
87	B+
83	B
80	B-
75	C+
65	C
50	D

**Course schedule:** This is a tentative course schedule subject to change.

Week	Date	Topics
1	09/04	vector spaces, subspaces, span, linear independence
2	09/11	basis, dimension, sum and direct sum, linear transformations
3	09/18	null spaces, ranges, rank-nullity theorem
4	09/25	basis and coordinates, matrix representation of linear transformation
5	10/02	system of linear equations, elementary row operations
6	10/09	product spaces, quotient spaces
7	10/16	dual space, transpose of a linear transformation
8	10/23	<b>Midterm</b>
9	10/30	determinant, Laplace expansion, Cramer's rule
10	11/06	eigenvalue and eigenvectors
11	11/13	characteristic polynomials
12	11/20	diagonalization

Week	Date	Topics
13	11/27	Holiday (Thanksgiving)
14	12/04	Cayley-Hamilton theorem
15	12/11	application of eigenvalues, course review

## General notes from University

### Inclusion:

The NYU Tandon School values an inclusive and equitable environment for all our students. I hope to foster a sense of community in this class and consider it a place where individuals of all backgrounds, beliefs, ethnicities, national origins, gender identities, sexual orientations, religious and political affiliations, and abilities will be treated with respect. It is my intent that all students' learning needs be addressed, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. If this standard is not being upheld, please feel free to speak with me.

### Student Accessibility:

New York University is committed to providing equal educational opportunity and participation for all students. The Moses Center for Student Accessibility (CSA) works with NYU students to determine and implement appropriate and reasonable accommodations as well as access available programs and resources to support equal access to a world-class education. Students who are requesting academic accommodations are advised to reach out to the Moses Center as early as possible in the semester for timely assistance.

### Exam Policies:

- Students will be allowed **a maximum of one make-up exam** throughout the entire semester per course for an excused reason listed below. There will be no remote makeup exams: All make-up exams must be taken in-person and must be taken **within one week** of the original exam date.

- If you miss an exam for a medical, religious, or family emergency reason, you must contact the Math Department at [soe.math@nyu.edu](mailto:soe.math@nyu.edu) in order to request a make-up exam **within two days** of the missed exam. Makeups will not be granted to students who do not notify the Math Department in a timely manner. For medical, religious, or family emergency reasons, in order to qualify for a makeup exam, you would need to be approved for an excused absence for the date of the exam by Tandon Student Affairs. **Excused absence requests must be submitted as soon as possible and no later than 2 days after the original in-class exam date by completing the form here and must list the exam as a missed assignment.**

- You may request permission for an out-of-sequence exam or final, if you are giving an official presentation or organizing an official session at a suitable out-of-town ACADEMIC conference that directly conflicts with the time of the exam. If you wish to do so, please send an email to [soe.math@nyu.edu](mailto:soe.math@nyu.edu) BEFORE you finalize your travel plans. Permission is not guaranteed. In particular, no accommodation will be made at all for non-academic conferences or for students going to a conference only as an attendee.

- We cannot accommodate out-of-sequence exams, quizzes, and finals for reasons of convenient travel, even if you have already purchased tickets. Please note carefully the date of your exams and final and plan your travel schedule accordingly.

- If you are a student athlete who has an exam conflict for reasons other than practice, please email a letter from NYU Athletics to [soe.math@nyu.edu](mailto:soe.math@nyu.edu) to request a make-up exam **at least three days** prior to the date of the exam.

#### **The Office of Student Advocacy:**

At NYU Tandon, we recognize that medical, mental health, or personal issues can sometimes affect your attendance and academic performance. If you are experiencing challenges that you feel are impacting your ability to attend class or succeed in your coursework, we encourage you to reach out to the **NYU Tandon Office of Student Advocacy**. The Student Advocacy team is here to connect you with the resources and support you need to address these challenges and ensure you can continue to thrive academically. If you begin experiencing any issues that may affect your attendance or academic performance, please reach out to the **NYU Tandon Office of Student Advocacy** as soon as possible as we will be unable to appropriately address these concerns as the semester progresses, so early communication is essential to ensure the support and resources you need. The **NYU Tandon Office of Student Advocacy** can be reached at [advocacy.tandonstudentlife@nyu.edu](mailto:advocacy.tandonstudentlife@nyu.edu) and is located in 5 MetroTech Center LC240.

#### **Academic Honesty:**

The Department of Mathematics reserves the right to impose the strongest academic sanctions for violations of Academic Integrity. Students are responsible for familiarizing themselves with Tandon's Student Code of Conduct including the Policies and Procedures on Academic Misconduct.

Definition: Academic dishonesty may include misrepresentation, deception, dishonesty, or any act of falsification committed by a student to influence a grade or other academic evaluation. Academic dishonesty also includes intentionally damaging the academic work of others or assisting other students in acts of dishonesty. Common examples of academically dishonest behavior include, but are not limited to, the following:

- Cheating: intentionally using or attempting to use unauthorized notes, books, electronic media, or electronic communications in an exam; talking with fellow stu-

dents or looking at another person's work during an exam; submitting work prepared in advance for an in-class examination; having someone take an exam for you or taking an exam for someone else; violating other rules governing the administration of examinations.

- Fabrication: including, but not limited to, falsifying experimental data and/or citations.

- Plagiarism: intentionally or knowingly representing the words or ideas of another as one's own in any academic exercise; failure to attribute direct quotations, paraphrases, or borrowed facts or information.

- Unauthorized collaboration: working together on work that was meant to be done individually.

- Duplicating work: presenting for grading the same work for more than one project or in more than one class, unless express and prior permission has been received from the course instructor(s) or research adviser involved.

- Forgery: altering any academic document, including, but not limited to, academic records, admissions materials, or medical excuses.

### **Midterm Progress Reports:**

We know timely and actionable feedback is vital for student learning and success. After the midterm exam, you will receive a Midterm Progress Report through NYU Connect. The report will let you know if your progress is strong, satisfactory, or of concern. Strong Progress in this course means you're doing well and are consistently and regularly participating in classroom or online discussions, as well as completing your weekly assignments on time. Satisfactory Progress in this course means you're doing well but there's room to grow and are sometimes participating in classroom or online discussion, as well as completing most of your weekly assignments. Concerns About Progress in this course means your professor has concerns about your performance, attendance, or other challenges, such as not participating in classroom or online discussions, regularly missing or doing very poorly on submitted assignments, and/or having multiple absences.